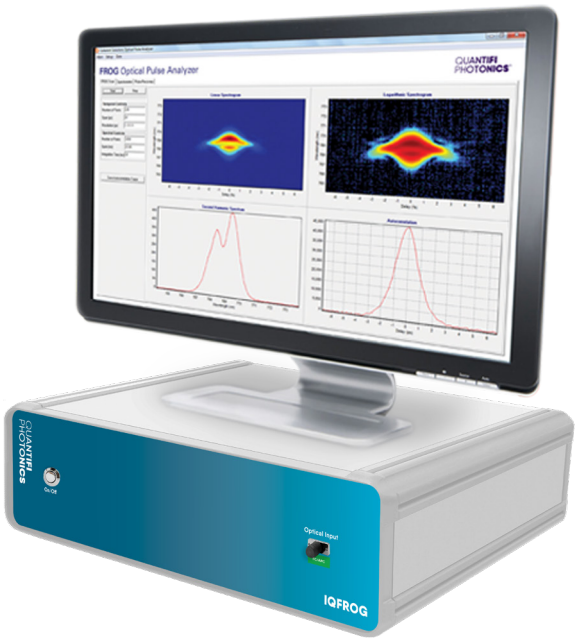
QUANTIFI PHOTONICS®
A Teradyne Company

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Please contact us for support of existing installations.



IQFROG

FREQUENCY-RESOLVED OPTICAL GATING PULSE ANALYZER

SPECIFICATION SHEET

quantifiphotonics.com

Version 3.5.1

The IQFROG measures pulse intensity and phase in both spectral and temporal domains, yielding a complete pulse characterization.

With its long delay arm and high resolution spectrometer, the IQFROG measures chirped pulses up to 50 ps wide, or, if transform limited, up to 7.5 ps wide (1.0µm) or 10 ps wide (1.5µm).



Autocorrelator function

The IQFROG can scan and save autocorrelation traces, even if the pulse is too broad (with a very narrow spectral width) or is unsuitable for FROG recovery. The IQFROG can be used as an autocorrelator and measure pulses up to 50 ps.

Long temporal scan range

The IQFROG uses a long mechanical translation stage to provide up to 200 ps of scan range to allow autocorrelation measurement of up to 50 ps long pulses. It is one of the few pulse analyzers on the market which can measure such broad picosecond pulses, as well as short pulses down to 300 fs width. In comparison the competitive SPIDER technique is limited in the ability to measure pulses broader than 1 ps.



Connectorized input

The connectorized input makes coupling of the beam easy and fast by eliminating the need to align the beam into the unit manually. IQFROG is by far the most easy-to-use optical pulse analyzer on the market.

Full software control

The mechanical control, alignment and tuning is controlled by the software, no more need to align manually.

Ease of Use

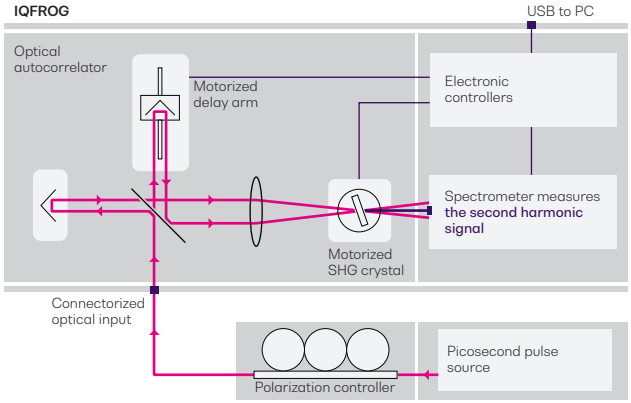
The IQFROG with its connectorized input, user-friendly full software control and USB connection to PC, makes it the smarter plug and play pulse analyzer.

HOW IT WORKS

The IQFROG is a spectrally resolved Second Harmonic Generation (SHG) autocorrelator.

It can resolve sub-picosecond pulses since it is not limited by the response time of the detector. At each delay position on the autocorrelation, a complete SHG spectrum is measured, recording both the spectral and temporal characteristics of the pulse simultaneously.

The two dimensional plot of SHG spectrum as a function of delay is referred to as a `spectrogram'. Once a spectrogram has been measured, a fast mathematical recovery algorithm is used to completely recover all the characteristics of the pulse, including pulse shape, spectrum, chirp and group delay.



FROG schematic diagram

HIGH SPECTRAL RESOLUTION

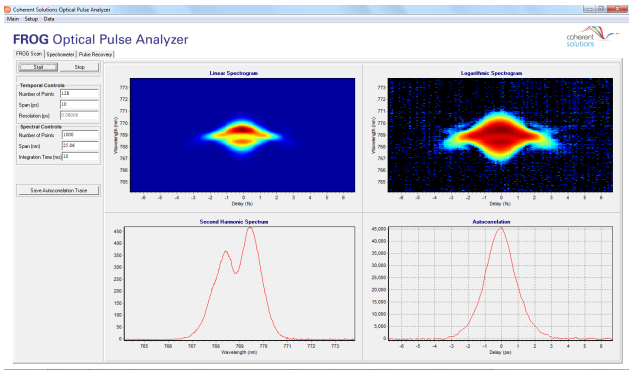
The FROG measurement technique requires the measurement of second harmonic spectrum of the pulse.

The resolution of the spectral measurement often limits the broadest pulse width that a pulse analyzer can measure, most other competitive products can only measure pulses less than 1ps. Coherent Solutions' IQFROG has a built-in high-resolution spectrometer to enable measurement of transform limited pulses.

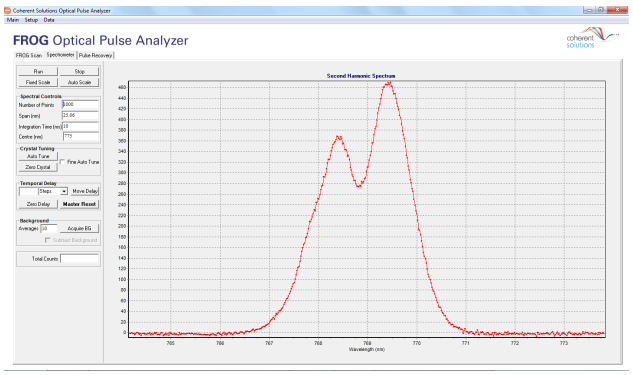
The IQFROG 1.0 µm enables measurement of transform limited pulses of up to 7.5 ps width, or broader if the pulse has a frequency chirp. It has a 1000 - 1100 nm input pulse wavelength range, making it a perfect fit for seed laser pulses for chirped pulse amplification (CPA).

The IQFROG 1.5 µm enables measurement of transform limited pulses of up to 10 ps width, or broader if the pulse has a frequency chirp. It has a 1520 - 1610 nm input pulse wavelength range, making it a perfect fit for C-band femtosecond and picosecond pulsed fiber lasers.

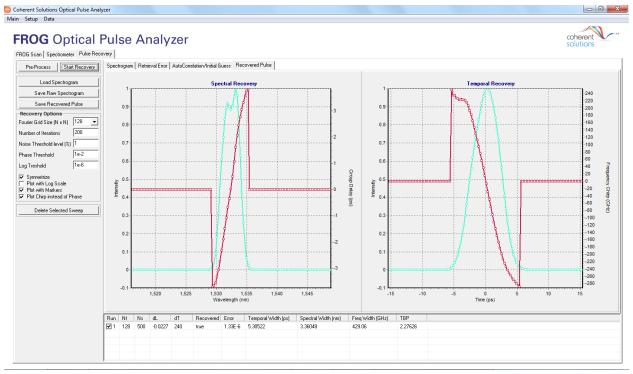
The IQFROG comes with dedicated all-in-one software, ‘Optical Pulse Analyzer’ (OPA) which controls the mechanicals and measures and recovers optical pulses using an intuitive graphical user interface.



FROG Scan functionality measuring the spectrogram and displaying its autocorrelation trace.



Spectrometer functionality displaying the second harmonic spectrum.



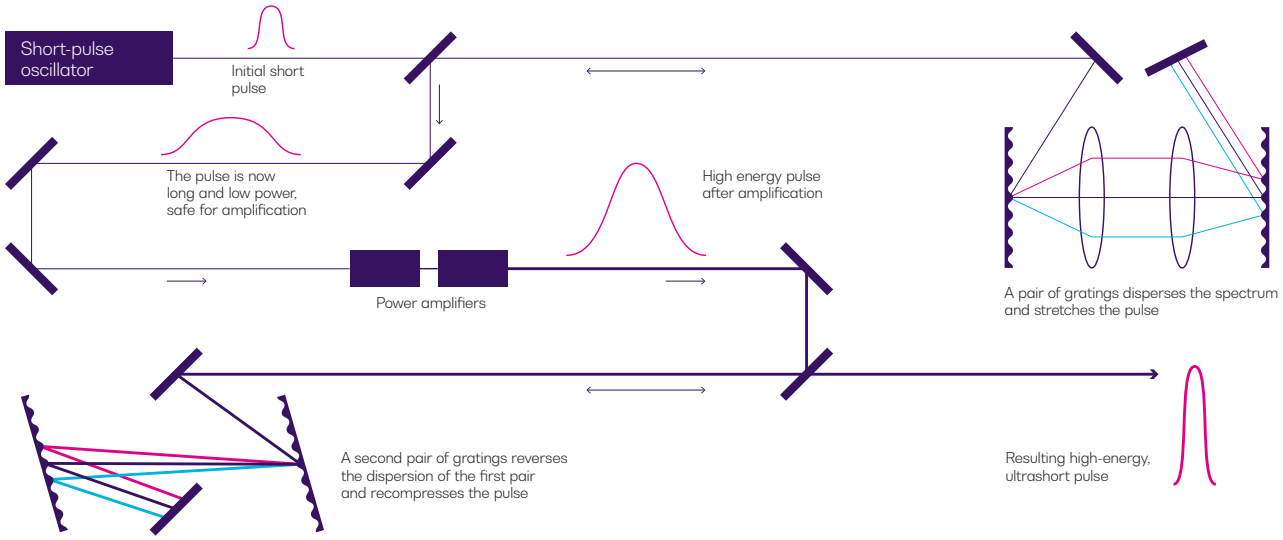
FROG pulse recovery functionality showing the pulse shape and chirp in both temporal and spectral domains.

- Use the IQFROG to obtain the complete expression of electric field of your optical pulse, so that it can be used in numerical simulations
- Characterize and optimize the optical pulses generated from lasers such as, Erbium Doped Fiber Laser, Gain switched laser, Saturable Absorber mode-locked laser and externally modulated pulse source
- Generate transform-limited pulses by compensating for the chirp measured using IQFROG
- Generate optical pulses with desired intensity and chirp profiles using an arbitrary optical filter and check the results with an IQFROG
- Device characterization using comparative measurements of input and output pulses

High power femtosecond and picosecond optical pulses are used for micromachining applications such as; ablating, etching and cutting of a wide range of materials as they minimize the thermal damage on the substrate.

A common technique employed to amplify the power of ultra-short pulses is Chirped Pulse Amplification (CPA).

CPA broadens, amplifies and then compresses the pulse and it is necessary to know the chirp and pulse characteristics at each stages of the CPA. IQFROG measures all the pulse characteristics necessary to optimize the CPA setup.



Chirped pulse amplification diagram

General Specification	IQFROG 1.0 µM	IQFROG 1.5 µM
Dimensions W x D x H	440 x 450 x 128 mm 17.32 x 17.72 x 5.04 inch	440 x 450 x 128 mm 17.32 x 17.72 x 5.04 inch
Weight	14 kg | 30.9 lbs	14 kg | 30.9 lbs
PC interface method	USB 2.0	USB 2.0
Operating system requirement	Windows 7, 8 or 10 (32 or 64 bit)	Windows 7, 8 or 10 (32 or 64 bit)
Power supply	~100 - 240 V; 50 / 60 Hz; 500 W	~100 - 240 V; 50 / 60 Hz; 500 W
Operating temperature range	5 °C to 45 °C 41 °F to 113 °F	5 °C to 45 °C 41 °F to 113 °F
Storage temperature range	-40 °C to 70 °C -40 °F to 158 °F	-40 °C to 70 °C -40 °F to 158 °F

	IQFROG 1.0 µM		IQFROG 1.5 µM
Crystal type	**BBO CRYSTAL**	**KDP CRYSTAL**	**LiNbO3**
Input pulse temporal FWHM [a]	0.3 - 7.5 ps (transform limited pulses)		0.3 - 10 ps (transform limited pulses)
Temporal scan range	200 ps		200 ps
Temporal resolution	15 fs		15 fs
Input centre wavelength [b]	1000 - 1100 nm		1520 - 1610 nm
Input pulse spectral FWHM	0.2 - 15 nm	0.2 - 25 nm	0.2 - 10 nm
Spectral resolution	150 pm		120 pm
Pulse repetition rate	Independent		Independent
Input RF clock required	No		No
Input peak power (saturation)	0.5 W^2	10 W^2	7 W^2
Input peak power (sensitivity) [c]	0.002 W^2	0.01 W^2	0.005 W^2
Input connector type	FC/APC or FC/PC		FC/APC or FC/PC

Notes

a. Broader pulses of up to 50 ps are measureable if the spectral FWHM is within the specified range.
b. Other centre wavelengths are also available. Please enquire for details.
c. Minimum value needed for a good recovery; product of average and peak power.

ORDERING INFORMATION

This product has been discontinued and is no longer available for purchase.

Please contact **support@quantifiphotonics.com** for support of existing installations.

WARRANTY INFORMATION

This product comes with a standard 1 year warranty.

Our portfolio of optical & electro-optical test modules is rapidly expanding to meet a wide range of customer requirements and applications.

For more details visit **quantifiphotonics.com/products**

Tunable Laser Sources



Versatile telecom laser sources with full tunability across C or L bands. Narrow 100 kHz linewidth, up to 16.5 dBm of power, optional whisper mode to disable frequency dither.

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Swept, tunable continuous wave (CW) laser source with 0.01 dB power stability and 400 nm/s high-speed scan rate for R&D and production testing.

Superluminescent Diode Broadband Light Source



Super-luminescent LED light source with high output power, large bandwidth and low spectral ripple and various wavelengths.

Erbium-Doped Fibre Amplifier (EDFA)



High power Erbium-Doped Fiber Amplifier for signal power amplification in C and L bands with various control modes, including automatic gain control.

Variable Optical Attenuator (VOA)



Fast attenuation speed with low insertion loss and built-in power monitoring. Operates in fixed attenuation or constant output power modes. Support SMF, MMF and PMF.

Polarization Controller & Scrambler



High-speed automated polarization control with broad wavelength coverage from 1260nm to 1650nm, low insertion loss and back reflection. Full remote control via intuitive GUI, LabVIEW or SCPI.

Optical Power Meters



Fast terminating or inline monitoring of optical signal power from -60 to +10 dBm across 750 – 1700 nm wavelengths. Model with logarithmic analog output for applications such as silicon photonics fiber alignment.

Optical Spectrum Analyzer (OSA)



Cost-effective, spectral measurement in a compact module with built-in analysis for: SMSR, OSNR & spectral width. Targeted wavelengths for specific applications in O band, C band & L band.

Optical-to-Electrical Converter



High bandwidth, broadband O-to-E converter. Available in a range of configurations; choose from 1 or 2 channels, AC or DC coupling and various conversion gain and operating wavelength ranges.

Digital Sampling Oscilloscope (DSO)



Digital equivalent-time sampling oscilloscope (DSO) with high-quality precision timebase and low jitter mode, available in 1 or 2 channels in a compact benchtop instrument.

Bit Error Rate Tester (BERT)



4 or 8-channel Pulse Pattern Generator and Error Detector at rates up to 29 Gbps for the design, characterization and production of optical transceivers and opto-electrical components.

Photonic Doppler Velocimeter (PDV)



Purpose-built module for Photonic Doppler Velocimetry (PDV). A circulator, two VOAs and a passive coupler all built into one compact module.

Optical Switch



Proven reliability and fast switching time. Wide variety of switch onfigurations: 1x4, 1x16, 16x16 and more. Models support SMF, MMF and PMF.

Photocurrent Amplifier



Versatile photodiode amplifier to measure photocurrent in photonic integrated circuit (PIC) applications. Digital and analog measurement.

Passive Component Integration



Integrate passive optical components of your choice such as WDM couplers, splitters, band-pass filters, PM beamsplitters and circulators. SMF, MMF and PMF.

Test. Measure. Solve.™

Quantifi Photonics provides test solutions to help customers unlock scalable and cost-effective high-volume manufacturing of photonic integrated circuits (PICs), co-packaged optics and pluggable optics. The company's portfolio includes a wide range of photonic test instruments, and digital sampling oscilloscopes, available as benchtop or the industry-standard PXI format to support cost-effective, high-throughput design verification testing and high-volume manufacturing.

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